



Garden Creek TMDL Development

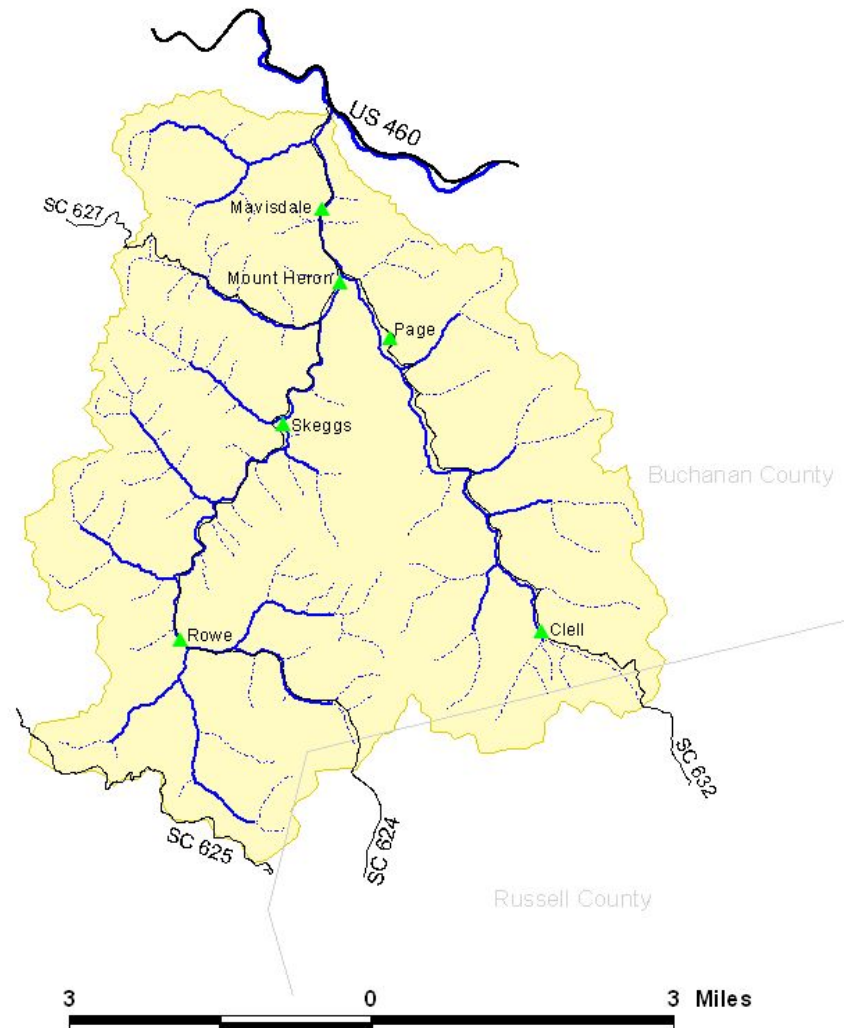
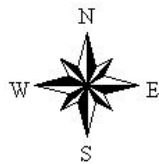
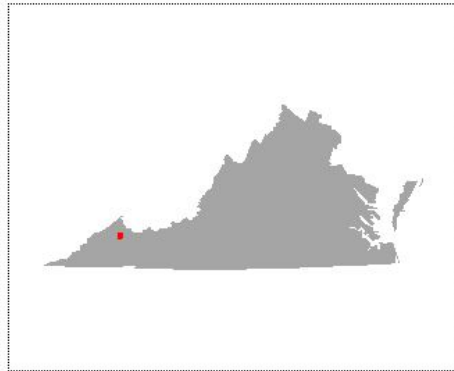
Second Public Meeting
March 22, 2007

2006





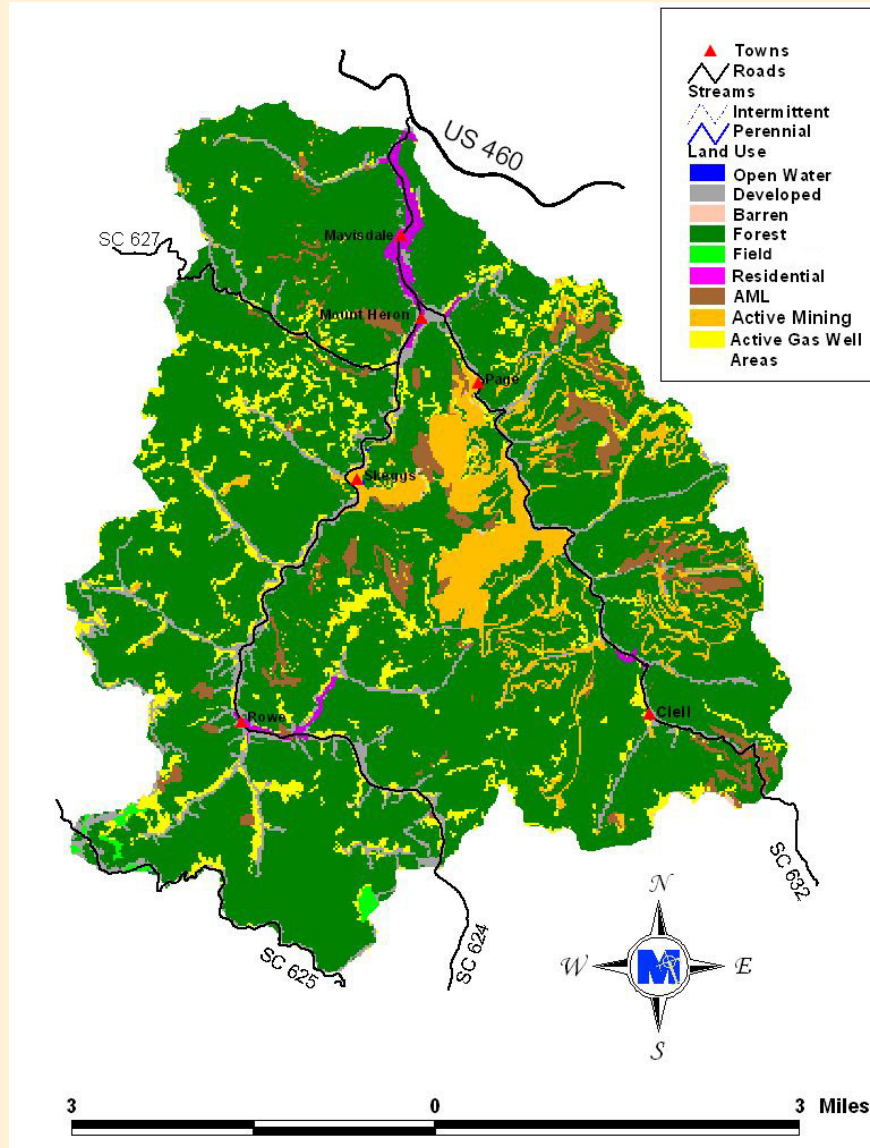
Where is the Watershed?





Garden Creek Watershed

Land use





Why Are We Here?

- To discuss TMDLs for Garden Creek
 - Total Maximum Daily Load
 - It is how much pollutant can enter the stream and have the stream meet the water quality standards





Why Are We Here?

Two Problems!

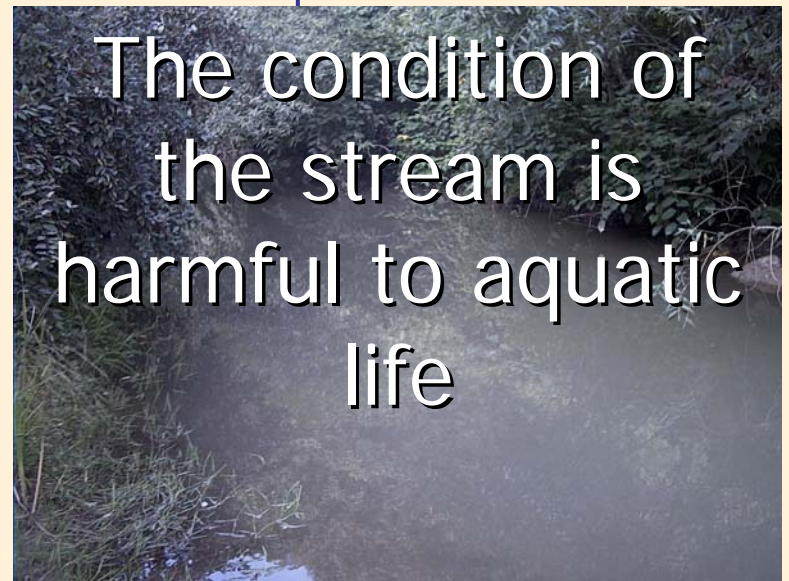


#1 Bacteria



Bacteria levels are
excessive

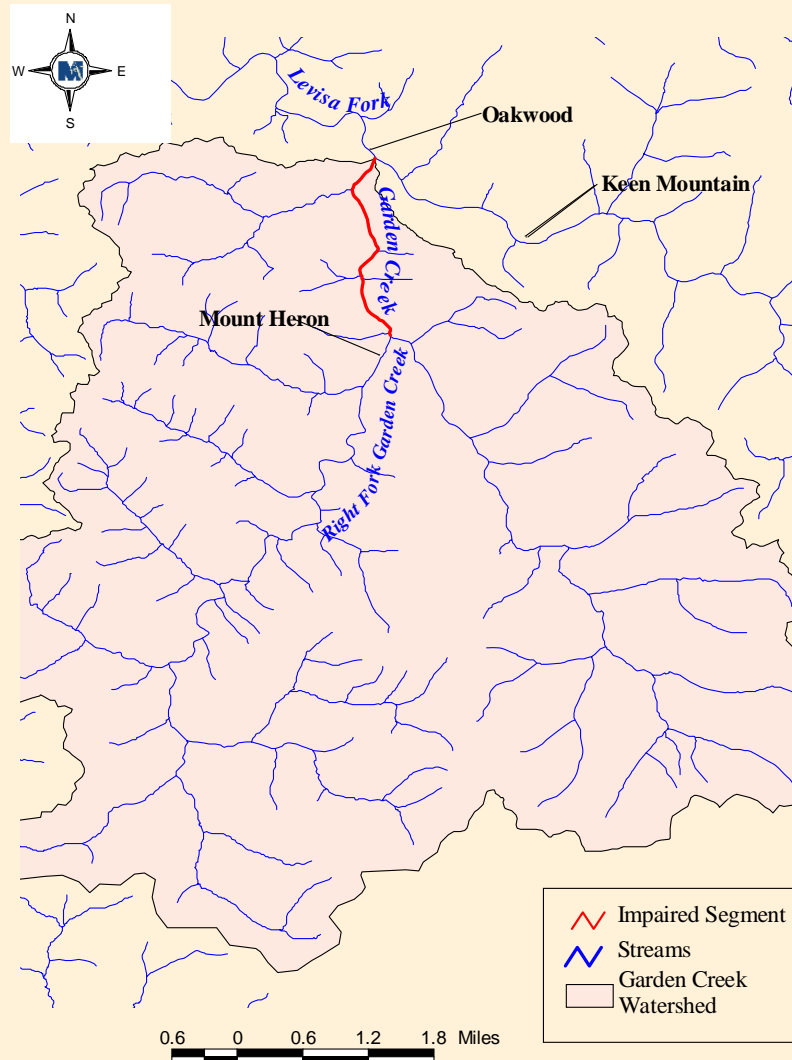
#2 Aquatic Life



The condition of
the stream is
harmful to aquatic
life



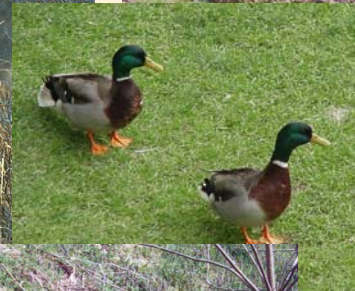
Where is the Impairment?



#1

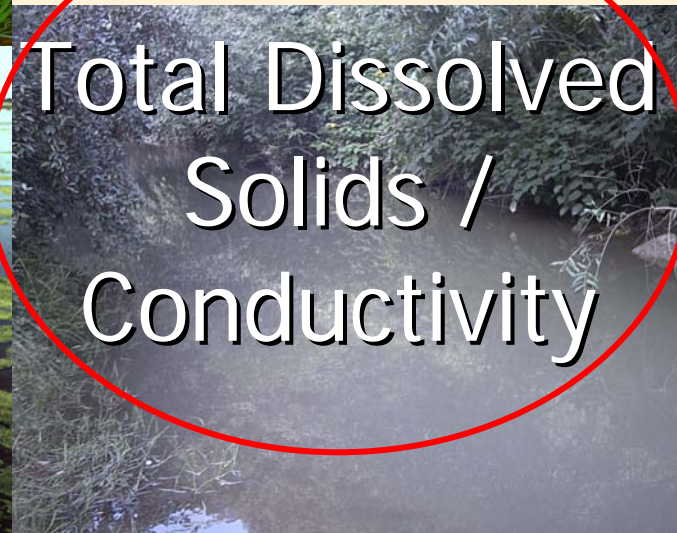
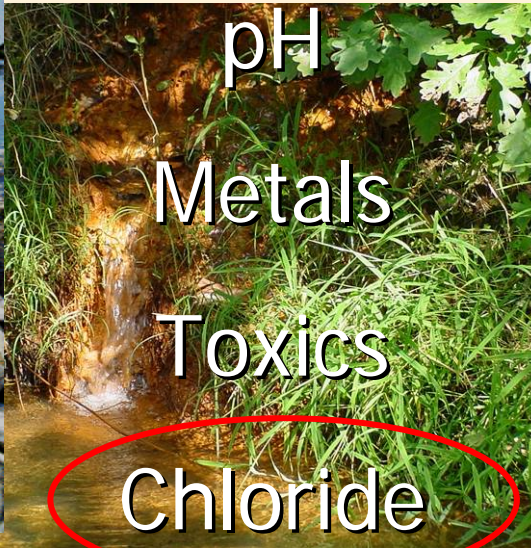
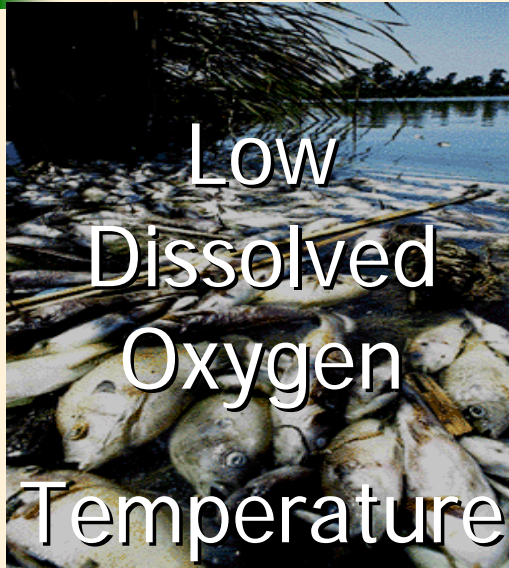
What are the Sources of Bacteria?

- Permitted discharges
 - Wastewater treatment facilities
- Human
 - Straight Pipes
- Pets
- Wildlife



#2

What is harming the Aquatic Life?





Endpoint Determination



- *E. coli* Bacteria – Garden Creek
 - Two standards
 - ◆ 126 cfu/100mL geometric mean
 - ◆ 235 cfu/100mL instantaneous sample
 - Bacteria Modeling
 - ◆ Average daily streamflow and bacteria



Endpoint Determination



■ ***Total Chloride***

- 230 mg/L based on a 4 day average not to be exceeded more than once in a 3 year period.
- Total Chloride Modeling
 - ◆ The water quality standard is the goal for the impaired stream.

■ **Total Dissolved Solids (TDS)**

- Reference Watershed Approach to endpoint selection
 - ◆ Dismal Creek in Buchanan, County, VA
- TDS Modeling
 - ◆ The 90th percentile of observed TDS in the reference stream is the goal for the impaired stream (373 mg/L).

#1

How do we Determine the TMDL?



Watershed data



TMDL

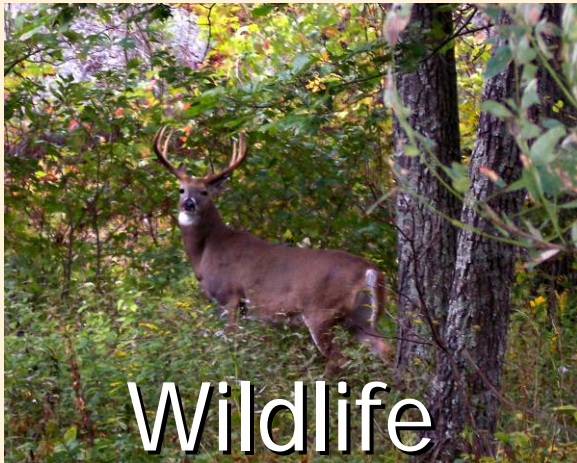


E. coli Load Reduction Scenarios

	Wildlife Land Based	NPS Livestock and Pet	Human Direct Deposit	Human Land Based			
Run#	Wildlife Direct	Active Mining, Active Gas Wells, AML, Barren, Forest, Grasslands, Developed, Roads	Residential	Straight Pipes	Failing Septics	GM % vio	SS % vio
Existing	0	0	0	0	0	100	50.36
5	0	10	99	100	100	5.56	10.86
8	0	70	99	100	100	0	0

#1

What *E. coli* reductions are required?



0%
(Direct)



100%



70%
(Residential = 99.4%)

#2

How do we Determine the TMDL?

TDS and
Chloride
Sources

Watershed data

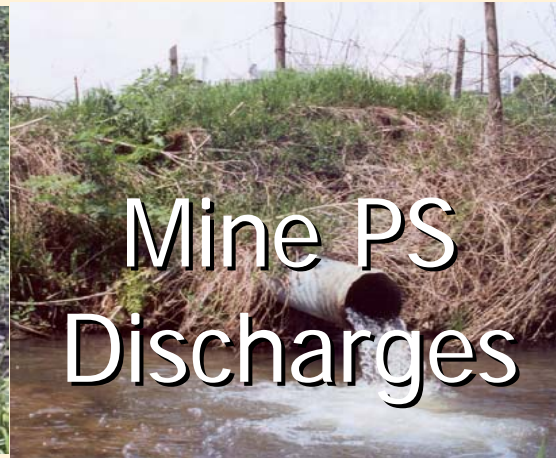
+



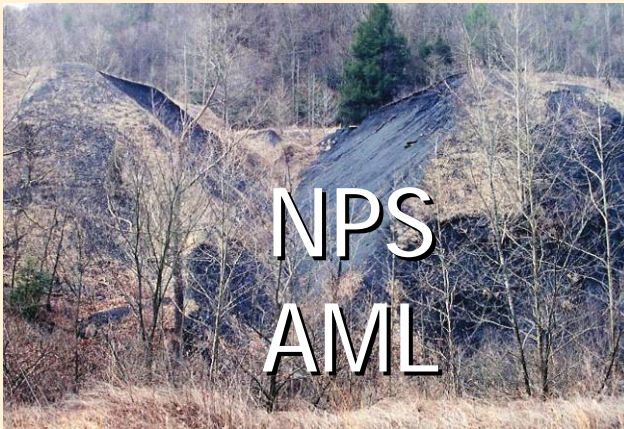
TMDL

#2

What Chloride reductions are required?



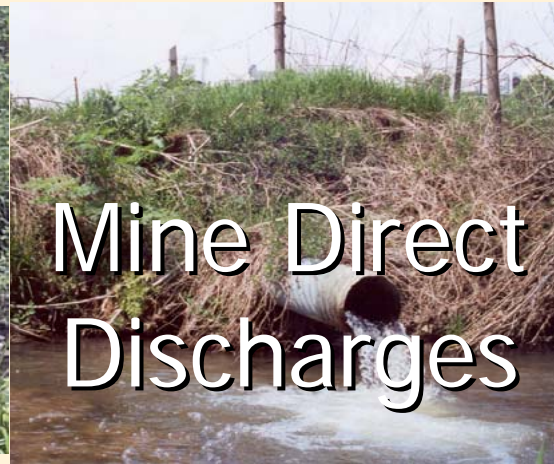
**70 %
Reduction**



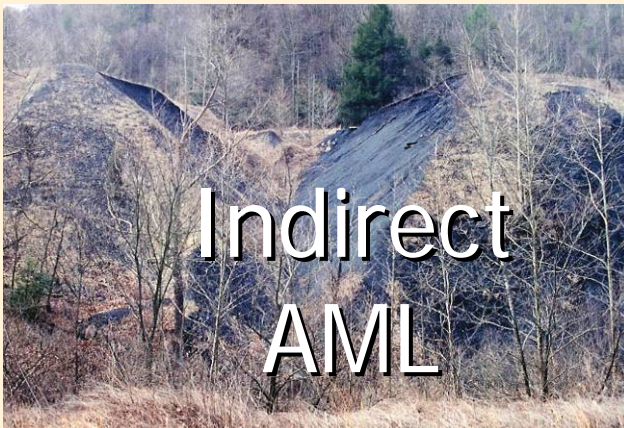
**5%
Reduction**

#2

What TDS reductions are required?



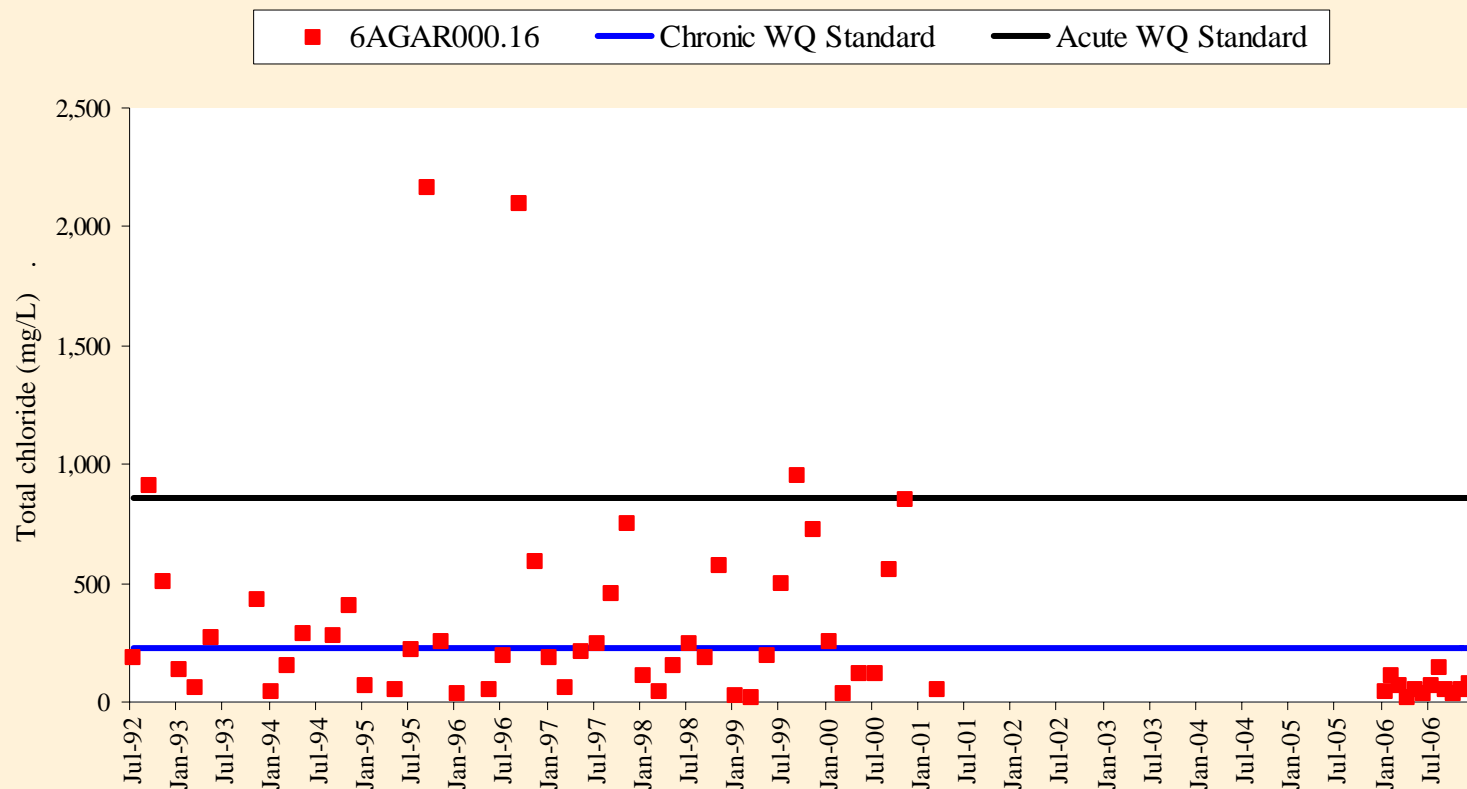
**77 %
Reduction**



**45%
Reduction**

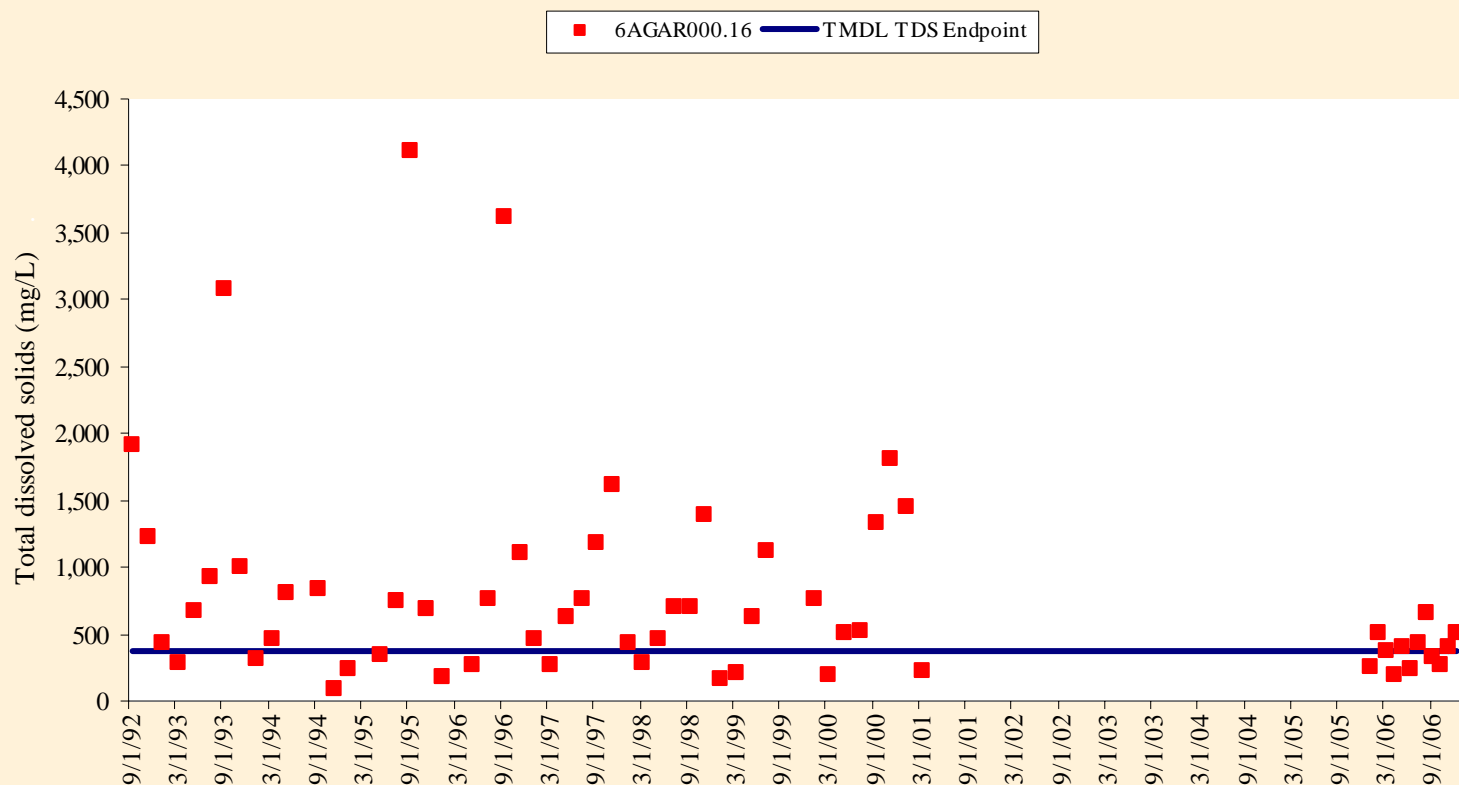


Chloride Concentrations at 6AGAR000.16, July 1992 – December 2006



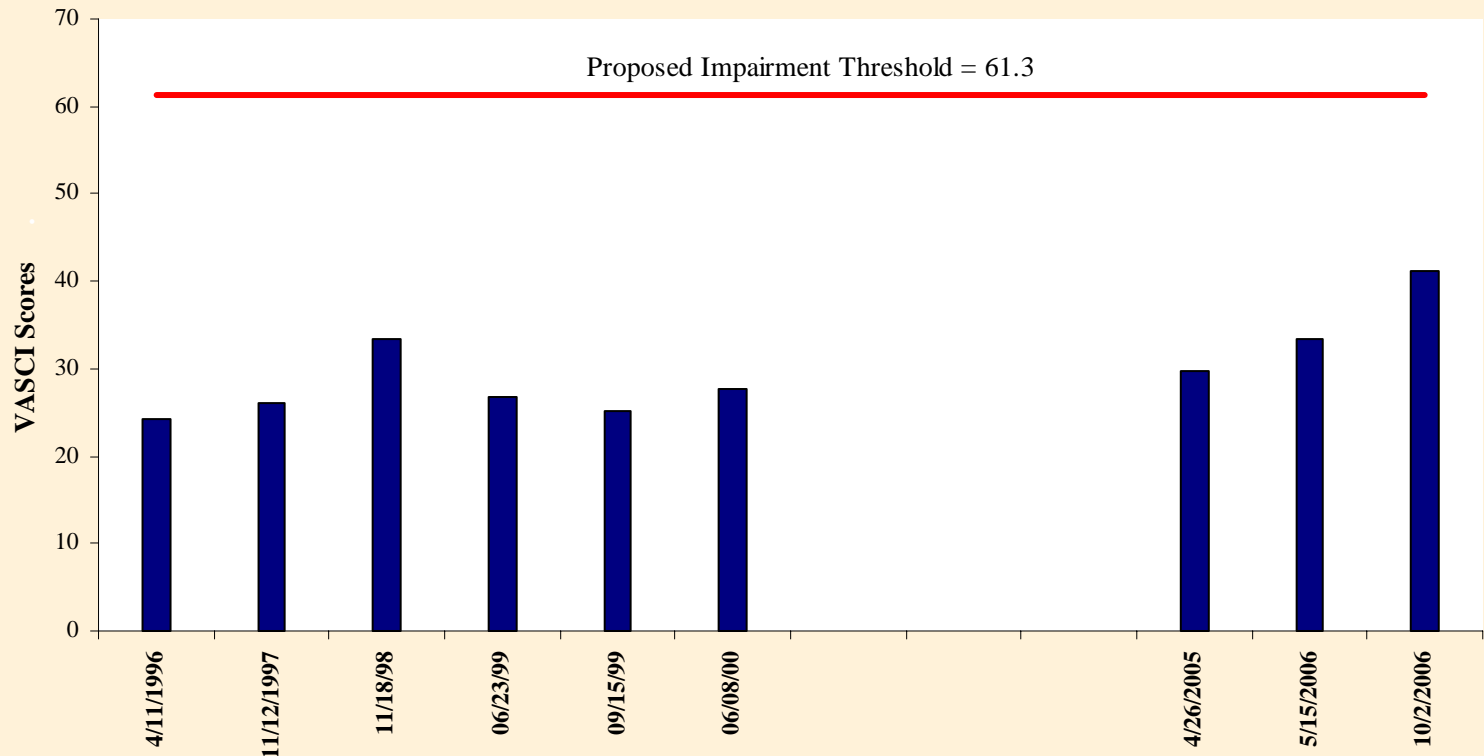


TDS Concentrations at 6AGAR000.16, July 1992 – December 2006





Benthic VACI Scores for 6AGAR000.16, April 11, 1996 – October 2, 2006



What's next?

- Public Review
- Submit to EPA
- State Approval
- Implementation Plan Development
- Implementation





Garden Creek TMDL Contacts

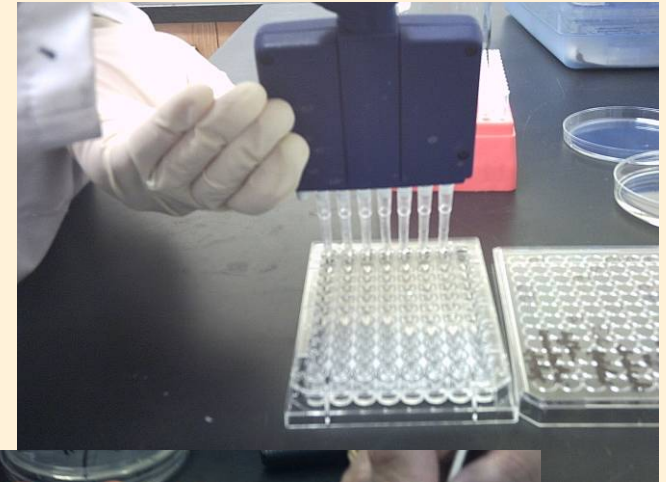
- Department of Environmental Quality
 - Shelley Williams, TMDL Project Coordinator
 - ◆ 276-676-4845
- Department of Mines, Minerals, and Energy; Division of Mine Land Reclamation
 - Joey O'Quinn, TMDL Project Coordinator
 - ◆ 276-523-8151
- Department of Conservation and Recreation
 - Theresa Carter, TMDL/Watershed Field Coordinator
 - ◆ 276-676-5418
- MapTech, Inc.
 - Rod Bodkin
 - ◆ 540-879-9294
- Civil & Environmental Consultants, Inc.
 - Dr. Jim Mudge
 - ◆ 800-365-2324



#1

Bacterial Source Tracking (BST)

- Determines bacteria source
 - human
 - pet
 - livestock
 - wildlife



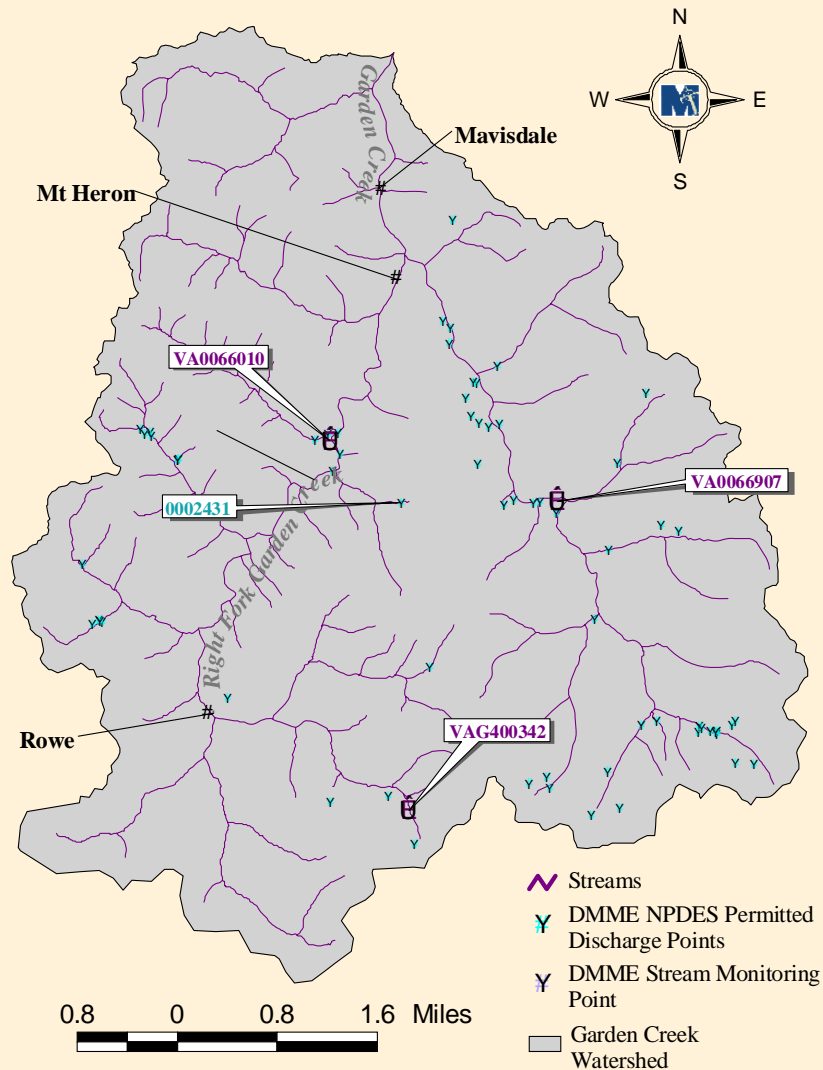


What is the Predominant Source?

Station	Stream	Wildlife	Human	Livestock	Pet
6AGAR000.16	Garden Creek	59%	24%	6%	10%
	Right Fork				
6AGRF000.11	Garden Creek	36%	46%	10%	8%



PERMITTED DISCHARGES





DEQ BENTHIC MONITORING SITES



LEGEND:

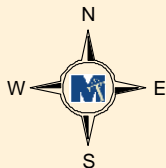
N VADEQ Monitoring Site

Garden Creek Impairment

Streams

Roads

Garden Creek Subwatersheds

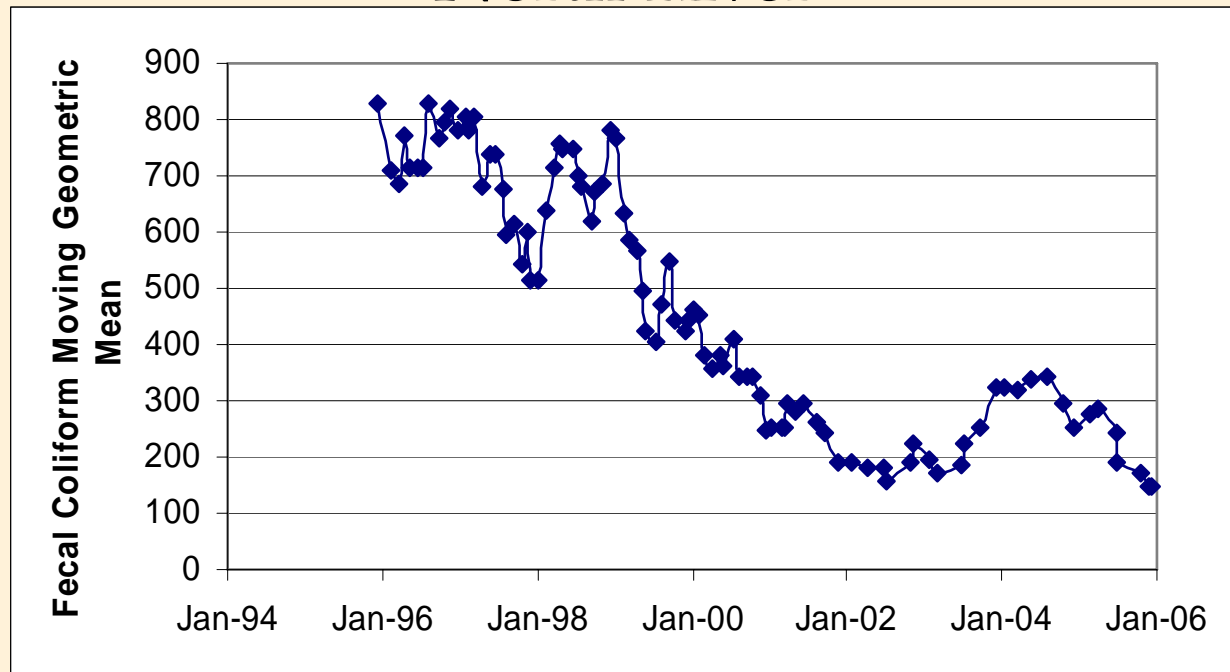




Implementation Plans in the Shenandoah Valley

- **North River (Lower Dry River, Muddy Creek): 2001**
- **Cooks Creek and Blacks Run: 2006**

North River





AQUATIC LIFE TMDLs

Chloride	Existing	Allocated
Land Based Indirect	6.58E+05	6.25E+05
Direct Loads	1.18E+06	3.57E+05
	1.84E+06	9.82E+05

TDS	Existing	Allocated
Land Based Indirect	4.31E+06	2.39E+06
Direct Loads	2.00E+06	4.62E+05
	6.31E+06	2.85E+06